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Analysis of the market potential for transport using the longer and heavier vehicles in Poland³

Introduction

Road transport plays a dominant role on the transport market in Europe. Despite long-running attempts to reverse this trend, taken mostly by institutions that create transport policy and ecological organizations, share of road transport is steadily increasing. This increase is not only quantitative, but also qualitative. Along with technological development more and more modern trucks and delivery vans arrives on the market and the standard of road infrastructure improves, which creates a coherent European transport network TEN-T. Increase in the number of vehicles in Europe is not accompanied by an increase in the amount of fatal accidents and improved technologies are to prevent the negative impact of road traffic on the environment. Against this background, the most important and most difficult challenge has become a problem of congestion on the roads. Construction of new motorways or adding additional lanes on existing roads is the temporary solution. In the longer term congestion seems to be the most important barrier in the development of road transport.

One of the opportunities to reduce the amount of vehicles on the roads is increasing the maximum parameters of road vehicles allowed on the European roads. Increase in cargo capacity or load capacity of a single heavy goods vehicle translates not only to reducing a vehicle fleet needed to perform the transport activity, but also to reducing of direct and indirect costs of transportation. Hence, there is constant pressure exerted by road carriers and freight forwarders to change the relevant provisions governing the maximum permissible load capacity and the maximum dimensions of road vehicles.

Over the last 50 years the maximum permissible load of the vehicle in the European countries has increased from 10 to 40 t, similarly, you can observe a gradual process of increasing the permissible length of vehicles [1]. The Directive 96/53 of 1996, the basic legal act governing the allowable parameters of road vehicles in the territory of EU, limits the weight of vehicles to 40 t and the length of the road trains to 18,75 m. Simultaneously, referring to the so-called "modular concept" described in the Directive, each EU country has the right to introduce derogations from the Directive allowing for longer and heavier vehicles on its territory, provided that the competition in the transport sector is not violated. The number of countries that have adopted this type of derogation from the Directive is steadily growing, and from the beginning the leaders among them are the Scandinavian countries. For example, Sweden since the beginning of the introduction of the current EU limitations reserved the right to use vehicles weighing up to 60 t and length of 25,25 m in their territory. Moreover, since 2009 Sweden carried out regular transports on the route to the North of the country with road trains of 90 t weight and a length of 29 m [2].

To sum up, we can talk about a few key trends that are currently on the transport market in Europe:

- 1) increased pressure exerted by selected EU countries and road carriers to increase the freedom of movement of the longer and heavier vehicles in Europe,
- 2) strong-minded postulates of green organisations and some railway operators to increase legal and fiscal constraints for heavy road transport, in particular for abnormal road transport,
- 3) inconsistency of activities of government administration and other transport policy institutions that very carefully formulate proposals of amendments to Directive 96/53⁴ conducive to road transport, at the same time upholding the sustainable development strategy and policy of the internalisation of external costs of transport.

In the context of the market trends presented above, this paper attempts to analyze the impact of increased freedom of movement longer and heavier vehicles on the Polish market. The authors shall formulate the detailed criteria for the exploitation of that kind of vehicles on the domestic market and evaluate the volume of cargo which could be transported by them. The analysis will allow transport and logistics companies as well as institutional decision-makers to evaluate the ability of longer and heavier vehicles to carry out the future transport activities.

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³ Reviewed paper.

⁴ Proposal for a Directive of the European Parliament and of the Council amending Directive 96/53/EC of 25 July 1996 laying down for certain road vehicles circulating within the Community the maximum authorised dimensions in national and international traffic and the maximum authorised weights in international traffic; COM(2013) 195 final, Brussels, 15.04.2013.

Definition and classification of longer and heavier vehicles

The maximum permissible parameters of heavy goods vehicles on the European roads specified by Directive 96/53 are as follows:

- articulated vehicle (tractor with semi-trailer): L= 16,50 m, W= 40 t
- road train (motor vehicle with trailer): L= 18,75 m, W= 40 t.

As mentioned above, Directive 95/53 allows EU Member States for entry into service in their territory vehicles that exceed the allowable parameters. This solution is subject to the provision that the non-standard vehicles do not significantly affect international competition in the transport sector. Currently, we can determine two kinds of non-standard vehicles, which are extensively used in Europe, mainly in Scandinavia and Northern Europe: EMS (European Modular System) and Megatrailer (tab. 1).

Tab. 1. Permissible maximal parameters of heavy goods vehicles in Europe [5].

	Directive 96/53		EMS	Megatrailer
Max. Length [m]	18,75	16,50	25,25	17,80
Max. Total Weight [ton]	40	44	60	40
Max. Load Weight [ton]	22	26	36÷42	26
Max. Volume [m ³]	90	100	130÷140	110
Europallets	36	33	51÷54	37

EMS vehicles are also called: Gigaliners, Megatrucks, Monstertrucks, Jumbotrucks, Öko-Kombis, and EuroCombi and have parameters: L= 25,25 m and W= 60 t. In accordance with the "modular concept", EMS combine standard road vehicles: tractor, semi-trailer of 13,60 m length and trailer/semi-trailer of 7,82 m length (fig. 1). The principle is easy forming of EMS vehicle, which means transforming the standard vehicles units into 25,25 m road train in regular parking area or road terminal.

Megatrailer vehicle, also called Eurotrailer, is a set of unit composed of a standard tractor and longer semi-trailer. The total length of the vehicle exceeds the maximum size specified in Directive 96/53 for this type of vehicle, and mostly equals 17,80 m. The additional length increases the cargo capacity of the vehicle of ca. 10 m³, which allows loading four additional europallets. A big advantage of longer semi-trailers is the ability to carry the 45 feet containers, which exceed the length of the loading area offered by the standard semi-trailers.

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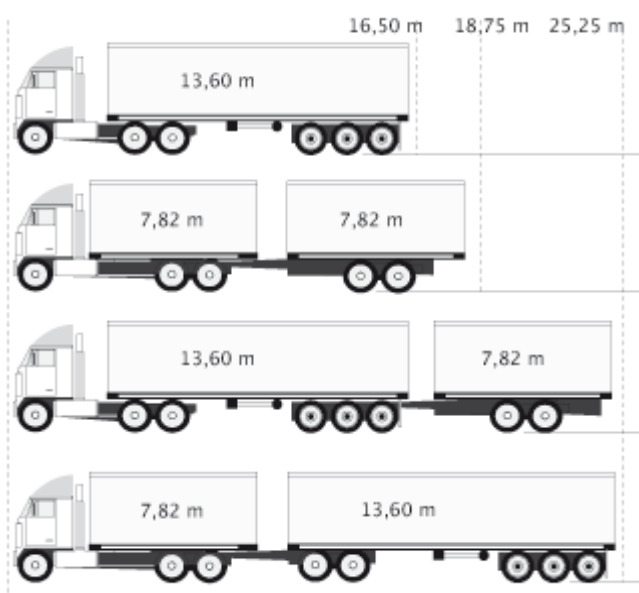


Fig. 1. Standard and EMS vehicles dimensions [3].

The two described non-standard vehicles will be subject to further analysis. It should be added that in Poland there is no experience with the use of EMS-type vehicles. Despite substantial trade with the Scandinavian countries carried out by road transport using ferry connections, the Polish transport system has not yet adopted EMS, so popular in Sweden and Finland. A slightly different situation applies to adoption process of Megatrailers. Since 2009, dozens of Megatrailers is tested on Polish roads and the first report of the Institute of Road Transport is very positive and recommends Megatrailers to allow for free movement [4].

Assessment of the potential market share of the EMS in Poland may be purely indicative and based on the experience of countries in Western Europe and Scandinavia, as well as knowledge of character of Polish transport market.

Experience of the European countries with the use of longer and heavier vehicles

The analyses and reports after the trial periods indicate both the negative effects and the benefits of the entry into service of EMS vehicles and Megatrailers⁵. Generally, there is agreement that EMS compared to standard semitrailers reduce road transport costs up to 30%, which is mainly due to savings on fuel costs, drivers pay and vehicle depreciation. However, the reduction in operating costs of road vehicles makes possible further negative conclusions. Opponents of the EMS legitimisation argue that lower costs of road transport will increase its competitiveness to rail transport. As a consequence, the decline in the transport market share of rail operators is anticipated, which in turn would increase the negative impact on the environment of entire transport sector. Other important arguments against the EMS legitimisation is the necessity to incur additional costs of adapting road infrastructure (including the roundabouts, bridges and parking lots), greater wear and tear of existing roads, and the deterioration of road safety.

Proponents of longer and heavier vehicles argue that these vehicles allow transporting the same cargo using fewer vehicles. In this context, untrue are assumptions about the negative impact on the environment, to a certain extent also on infrastructure and traffic security.

The experiences of countries that have legitimated domestic traffic of EMS give rise to argue that above described negative effects are questionable. In any of analysed countries, there has been observed decline in market share of rail transport, the deterioration of the traffic safety and infrastructure degradation. The number of road carriages has been reduced, therefore it can be assumed that external costs are also reduced. On the other hand, in some countries (e.g. Denmark) infrastructure adjustment costs were incurred.

One cannot argue that some negative effects of increasing the allowable parameters of heavy goods vehicles shall certainly not occur, especially taking into consideration the regional differences in the transport sector. Moreover, conditions of transport activity change significantly due to: changes in costs (e.g. fuel), process of infrastructure investment and development of the international trade. All these conditions can radically change the profitability of road transport, and thus their competitiveness to rail transport.

It can be assumed that the largest expenses associated with the EMS entry into open service are the infrastructure adapting costs. However, no study has taken up the reliable estimation of these costs. In the case of the Megatrailers infrastructure adapting costs are minimal and relate primarily to the modernisation of limited number of parking lots.

The analysis of demand for transport with use of longer and heavier vehicles in Poland

Based on the above arguments arising from the experiences of European States and knowledge of the Polish market, we can take certain assumptions for a model of functioning of the type of vehicles EMS and Megatrailers in Poland.

Operating of Megatrailers in our country, despite their larger than the standard length, shall not give rise to any requirement to adapt infrastructure and should not have a negative impact on road safety. This was confirmed by the already mentioned report of the Institute of Road Transport. Full permission of Megatrailers, thanks to their functionality in the transport of 45' container is the solutions to the rising demand for the carriage of these cargo units in Poland.

Operating of the EMS vehicles will have a much greater impact on the national transportation system. The first necessary assumption is to assume that these vehicles will serve primarily international and national connections over long distances. Secondly, in order to substantially reduce the negative impact of such EMS vehicles on traffic congestion, it must be assumed that these vehicles will be permitted to navigate on the dual carriageways. In practice, this limits their movement to a network of motorways and express roads. Thirdly, a significant limitation stems from the need to adapt the elements of the road infrastructure to the needs of heavier vehicles EMS. In particular, it refers to the large number of bridges and road culverts, which as standard are designed for vehicles with GVW = 50 t. The lack of real possibility of incurring the costs of adapting road infrastructure to the increased loads that have vehicles with GVW = 60 t, restricts the use of EMS vehicles only to the standard DMC = 44 t in particular. The rest must also assume that having a large number of sets of traffic and operating in the international market will make the EMS will be viable for large carriers.

⁵ On the basis of: [5], [6], [7].

Finally, it should be also assumed that necessity for a large number of semitrailer trucks and operating in the international market will make the EMS more profitable for large carriers.

In the view of the above assumptions the following specific analyse criteria of the demand for transport with the use of a vehicle by EMS in Poland have been formulated:

- 1) international and domestic transport connections with the use of target network of motorways and expressways⁶;
- 2) minimal distance of carriage is 300 km;
- 3) the carried cargoes have to be characterized by the middle and high stowage factor, what means, that they will use the vehicle cargo space so as not to exceed GVM= 44 t;
- 4) carriers offering transportation services must have min. 10 semitrailer trucks and employ min. 10 employees.

Tab. 2. The Analysis of the potential market for semi-trailer trucks of EMS types [5]⁷.

	The assumptions	Results of the Analysis
1	Estimation of the size of the road transport market on the basis of in-house transportation (mass and transport work) in national and international transport	Domestic market: 702,5 mln tons, including 136,2 mln tons transported on the distance of 150–499 km and 14,5 mln tons transported on the distance of above 500 km International market: 133,8 mln tons the average transport distance of 848 km
2	Given the criterion of distance of transport, EMS can Take over whole international transport and part of the domestic one (50% of transport on the distance of 150–499 km i 100% of transport on the distance of above 500 km)	EMS market: 216,4 mln tons, including 82,6 mln tons transported in the domestic transport on the average distance of 327 km and 133,8 mln tons transported in the international transport
3	Given the cargo structure, cargoes suitable for EMS transport are: containers, pellets and about 50% other general cargo	EMS market: 234, 9 mln tons on average distance of 445 km
4	Given the criterion of employment – carriers employing more than 9 persons.	EMS market: 202,4 mln tons on average distance of 488 km, potential carriers own about 43000. Semi-trailer trucks of average load capacity of 25,6 tons and about 15000 trucks of average load capacity of 9,3 tons
5	Given the criterion of size of a fleet - carriers owning more than 10 vehicles	EMS market: 2471 of companies owning about 64 thousand trucks
6	Determination of multi-criteria	EMS market: 215 mln tons transported on the average distance of 480 km with the use of 60 thousands of vehicles
7	The calculation of vehicles operating parameters, assuming an average utilization of 70% of a payload	Vehicles on EMS market: 229 transports/vehicle, average capacity – 14,7 t, average annual mileage 110 thousands km

Furthermore in the Analysis it is not assumed, that freight served by rail or inland water transport will be taken over by EMS sector. Because of that the goal of the Analysis is to extract the part of the present road transport, which would naturally gravitate towards service by road train of EMS type. Taking into account the above criteria, a deduction based on the statistical data from year 2011 can be conducted. The results of it are presented in the table 2.

According to the results of the Analysis from table 2, the size of the road transport market, which supposedly could be served by EMS road trains is about 215 mln tons, what 26% of cargo volume transported by this mode in the year 2011. The Analysis should take into account additional aspects that affect the decision to use EMS, especially important in the first stage of decision-making process, including:

- 1) an enterprise adapting EMS should have the investment means needed to purchase the coupling units and other accessories necessary to operate longer road trains,
- 2) the drivers operating EMS have to possess additional permissions allowing to driver to driver such vehicles,
- 3) an enterprise should have certainty of transport tasks incumbent to EMS services, such as long-term transport contracts in international relations,
- 4) EMS vehicles must move on roads designated for this type of vehicle, including mostly highways and two-lane expressways,
- 5) EMS vehicles must be connected and disconnected in a specially designated road junctions

The above arguments result in the significant narrowing of the real market for EMS vehicles, as evidenced by statistical and other practical experiences with using EMS vehicles in Europe (table 3).

In practice, the present polish EMS vehicle market can be estimated in the first phase of legislative changes at 20 to 30 million tons of cargo, and that's assuming the finishing of infrastructure projects in the network of motorways and express roads. That is a fairly far prospect of permission of EMS in Poland, which can be determined on about 2020.

⁶ Rozporządzenie Rady Ministrów zmieniające rozporządzenie w sprawie sieci autostrad i dróg ekspresowych (Dz. U. z 2009 r. Nr 187, poz. 1446).

⁷ Own elaboration on the basis of data from: Transport, Wyniki działalności w 2011 r., GUS, Warszawa 2012.

The market for Megatrailers vehicles is somewhat easier to estimate, as it can be linked to market of freight 45' container, which can be carried only by this type of vehicles. In 2011, the number of containers 45' in transshipped in the Polish ports was relatively small⁸:

- 1) Szczecin–Świnoujście – 18 units in export and 20 units in import,
- 2) Gdańsk – 1500 units in export and 1500 units in import,
- 3) Gdynia – 1700 units in export and import.

The reason for the low share of 45' containers, as may be supposed, is the technological limitations of port terminals and the lack of port logistics connections allowing for the transport of longer containers.

With the admission for longer trailers to be freely operated, the road transport operators will be able to compete more effectively with train operators in using long container units. In addition to the transport of containers Megatrailers create a real opportunity to use the longer swap bodies, which in large quantities are handled in Germany, and presently the practice is not common in Poland. Given the above, the market for vehicle of Megatrailers type can be assessed now at about 0.1 mln tons with the great development trend in the nearest future.

Summation

Market potential analysis for transport using the longer and heavier vehicles showed possibility in Poland to extend the allowed length while maintaining the current weight limits of the vehicles. Without undue delay, there is a possibility of the entry into unlimited service of Megatrailers. Admission for free operation of the EMS type vehicles is primarily determined by the completion of the construction of motorways and expressways in Poland. Only these roads shall ensure that there is appropriate safety of operation with use of road sets of 25 m length, assuming adaptation existing parking places, which also could be used as points of connecting and disconnecting the long vehicles sets.

Assuming that by 2025 EMS road trains will be put into service in Poland, we can assume the following impact of this move on the transport market:

- 1) The rail position should not be threatened, by rail are mostly heavy loads transported and EMS road trains with GVW = 40 tons cannot take over existing customers from rail,
- 2) impact on road transport market will be quite limited, estimates show the possibility of taking over in the first few years between 2.5% and 3.5% of road freight,
- 3) introduction of the EMS vehicles should have a positive impact on external costs caused by road and neutral impact on traffic safety.

It should be remembered that the increase in the permissible maximum dimensions and total weight of vehicles only creates legal conditions. Eventually, the scale of the use of such vehicles depends on whether the business will be interested in using them. Assumed profitability of applying EMS road trains in comparison to standard combinations may not be sufficiently convincing argument. The obvious obstacle resulting from infrastructure constraints will lower market flexibility of these vehicles. As the investment works progress opportunities to use longer road trains will increase. Additional condition of the gradual increase in the share of EMS vehicles in the market will be the conviction large shippers to this solution, by creation for them a dedicated offer. These conditions are very difficult to meet in Poland today, as the structure of the economy is quite fragmented and the TSL market is also fragmented.

The purpose of the paper was not to present firm view on increasing the maximum permissible parameters of road vehicles in Poland, but to give the pros and cons of such a decision and an estimate of its the market consequences. The authors propose to carry on further research in this area. It is necessary among others to collect detailed data on the necessary adaptation works for the needs of admission of longer and heavier vehicles to the wider traffic. It is also necessary to develop innovative methods for calculating the real cost-effectiveness of LHV both at micro and macro level. It seems that a particular challenge is to estimate the actual external costs for these vehicles in the domestic market, despite the lack of any empirical data in this field.

Abstract

In accordance with title, the subject of research is the market potential for cargo transport using the longer and heavier vehicles (LHV) in Poland. The vehicles of EMS and Megatrailer types, have been defined and classified. The road transport market was examined, which in theory could be supported using the vehicles of EMS and Megatrailer types. The experience of European countries in exploitation of LHV were synthetically described. The purpose of the analysis was to present advantages and disadvantages for legal changes increasing the maximum permissible parameters of road vehicles in Poland and the medium-term market consequences. Analysis ends conclusions concerning the anticipated volume and quality changes in the transport market as a result of the entry into service longer vehicles in Poland.

⁸ The data obtained from the Ministry of Transport, Construction and Maritime Economy.

Analiza potencjału rynkowego dla transportu ładunków z użyciem dłuższych i cięższych pojazdów typu LHV w Polsce

Streszczenie

Zgodnie z tytułem, przedmiotem badań jest potencjał rynkowy dla transportu ładunków z użyciem dłuższych i cięższych pojazdów typu LHV w Polsce. Przeprowadzona analiza dotyczyła pojazdów typu EMS i Megatrailer, które zostały zdefiniowane i sklasyfikowane. Określono wielkość rynku przewozów drogowych, który teoretycznie mógłby być obsługiwany za pomocą zestawów drogowych typu EMS i Megatrailer oraz syntetycznie przedstawiono doświadczenia z ich dotychczasowej eksploatacji w krajach Europy. Celem analizy było przedstawienie plusów i minusów dla zmiany prawnej polegającej na szerszym dopuszczeniu dłuższych i cięższych zestawów w Polsce i określenie dla tej zmiany średnioterminowych konsekwencji rynkowych. Analizę kończą wnioski klasyfikujące i kwantyfikujące przewidywane zmiany na rynku transportowym będące efektem dopuszczenia do ruchu w Polsce dłuższych pojazdów.

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